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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/945,535	08/30/2001	Kie Y. Ahn	1303.026US1	2681

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06/05/2002

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EXAMINER

BLUM, DAVID S

ART UNIT	PAPER NUMBER
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2813

#4

DATE MAILED: 06/05/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/945,535

Applicant(s)

AHN ET AL.

Examiner

David S Blum

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 April 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 and 51-56 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 55 and 56 is/are allowed.
- 6) ☒ Claim(s) 1, 2, 5-10, 13-15, 18-23, 26-31, 34-37, 51, 52 and 54 is/are rejected.
- 7) ☒ Claim(s) 3, 4, 11, 12, 16, 17, 24, 25, 32, 33 and 53 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Claims 1-37 and 57-61 in Paper No. 3 is acknowledged.

Drawings

2. Figures 1 and 2A-2C should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

3. Claims 1-2, 5-10, 13-15, 18-23, 26-31, 34-37, 51-52, and 54 rejected under 35 U.S.C. 112, second paragraph, as failing to set forth the subject matter which applicant(s) regard as their invention. Evidence that claims 1-2, 6-10, 13-15, 18-23, 26-31, 34-37, 51-52, and 54 fail(s) to correspond in scope with that which applicant(s) regard as the invention can be found in Paper No. 1 filed 8/30/01. In that paper, applicant has stated that the novel process of forming a gate oxide layer includes thermal evaporation deposition of a metal layer and more particularly electron beam evaporation of the metal (summary of the invention) , and this statement indicates that

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the invention is different from what is defined in the claim(s) because the independent claims (1, 9, 14, 22, 30, and 51) do not limit the invention in terms of thermal evaporation deposition method. The claims allow for any vapor deposition method.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

5. Claims 1-2, 14-15, and 53-52 are rejected under 35 U.S.C. 102(e) as being clearly anticipated by Maiti (US006020024A).

Maiti teaches all of the positive steps of claims 1-2, 14-15, and 53-52 in that a zirconium (group IVB) layer is deposited on a transistor body region by an evaporation technique and oxidized to form an oxide layer (column 3 lines 30-52) between first and second source/drain regions (figure 3). A gate (20) is coupled to the metal oxide layer. It is understood that Maiti teaches vapor deposition of a metal oxide or sputtering and oxidation of a metal layer and that the instant application teaches electron beam evaporation as an improvement to sputtering and oxidizing the metal. The claims as

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written are broad so that they encompass all evaporation methods and sputtering is a physical thermal evaporation deposition technique.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 22-23, and 30-31, are rejected under 35 U.S.C. 103(a) as being unpatentable over Maiti (US006020024A) in view of admitted prior art.

Maiti teaches all of the positive steps of claims 22-23, and 30-31 except for the application of wordlines, sourcelines, bitlines and system busses. Maiti teaches a zirconium (group IVB) layer is deposited on a transistor body region by an evaporation technique and oxidized to form an oxide layer (column 3 lines 30-52) between first and second source/drain regions (figure 3). A gate (20) is coupled to the metal oxide layer. It is understood that Maiti teaches vapor deposition of a metal oxide or sputtering and oxidation of a metal layer and that the instant application teaches electron beam evaporation as an improvement to sputtering and oxidizing the metal. The claims as written are broad so that they encompass all evaporation methods and sputtering is a physical thermal evaporation deposition technique.

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Maiti teaches that the device formed is a metal oxide field effect transistor with a high k metal gate for IC's. The admitted prior art (pages 1-4) teaches that these devices are commonly used in IC's particularly processor chips, mobile telephones, and memory devices. These devices commonly use wordlines, sourcelines, bitlines and system busses.

One skilled in the requisite art at the time of the invention would modify Maiti by completing the device and circuit to form IC's, particularly processor chips, mobile telephones, and memory (arrays) devices (which include wordlines, sourcelines, bitlines and system busses) as taught by the admitted prior art to be conventional practice .

8. Claims 5-6, 13, 18-19, 26-27, and 34-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maiti (US006020024A) in view of the admitted prior art as applied to claims 1, 7, 9, 14, 20, 22, 28, 30, 36, and 51 above, and further in view of Yano (US005810923A).

Maiti and the admitted prior art teach all of the positive steps of claims 5-6, 13, 18-19, 26-27, and 34-35 except for the temperature of the substrate, oxidizing in atomic oxygen, and oxidizing temperatures. Maiti is silent as to the substrate temperature and oxidizing temperature. Yano teaches electron beam evaporation of zirconium oxide at substrate temperatures of 300-700 degrees Celsius (column 10 line 5). Although Yano is depositing zirconium oxide, not zirconium as Maiti, Yano suggests reasonable temperatures for the deposition and oxidation of the metal. These ranges are

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considered to involve routine optimization while it has been held to be within the level of ordinary skill in the art. As noted in *re Aller*, the selection of reaction parameters such as temperature and concentration would have been obvious:

"Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art. Such ranges are termed "critical ranges and the applicant has the burden of proving such criticality.... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation."

In *re Aller* 105 USPQ233, 255 (CCPA 1955). See also In *re Waite* 77 USPQ 586 (CCPA 1948); In *re Scherl* 70 USPQ 204 (CCPA 1946); In *re Irmischer* 66 USPQ 314 (CCPA 1945); In *re Norman* 66 USPQ 308 (CCPA 1945); In *re Swenson* 56 USPQ 372 (CCPA 1942); In *re Sola* 25 USPQ 433 (CCPA 1935); In *re Dreyfus* 24 USPQ 52 (CCPA 1934).

Yano deposits the metal layer with atomic oxygen (electron beam) suggesting that Maiti could anneal in atomic oxygen rather than molecular oxygen.

One skilled in the requisite art at the time of the invention would have modified Maiti by substituting atomic oxygen for molecular oxygen as suggested by Yano and used any ranges or exact figures suitable to the method in the process of deposition regarding temperature using prior knowledge, experimentation, and observation with the apparatus used in order to optimize the process and produce the metal oxide layer structure desired to the parameters desired.

Allowable Subject Matter

9. Claims 3-4, 11-12, 16-17, 24-25, 32-33, and 53-54 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in

independent form including all of the limitations of the base claim and any intervening claims.

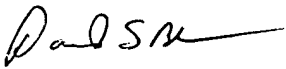
Claims 3-4, 11-12, 16-17, 24-25, 32-33, and 53-54 limit the instant invention to evaporating the metal by electron beam evaporation for evaporation deposition. This in combination with the other limitations of claims 3-4, 11-12, 16-17, 24-25, 32-33, and 53-54 is not taught or suggested by the prior art of record. Maiti (US006020024A) deposits by sputtering. Yano (US005810923A, US005801105A, and US006387712B1) teaches evaporating the metal and oxygen by electron beam evaporation for evaporation deposition of a metal oxide.

10. Claims 55-56 are allowed.

Claim 55 limits the instant invention to evaporating the metal by electron beam evaporation for evaporation deposition. This in combination with the other limitations of claim 55 is not taught or suggested by the prior art of record. Maiti (US006020024A) deposits by sputtering. Yano (US005810923A, US005801105A, and US006387712B1) teaches evaporating the metal and oxygen by electron beam evaporation for evaporation deposition of a metal oxide.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to David S. Blum whose telephone number is (703)-306-9168 and e-mail address is David.blum@USPTO.gov .

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached at (703)-306-2794. Our facsimile number for Before-Final Communications is (703)- 308-7722 and for After-Final Communications is (703)- 872-9319. Our receptionist's number is (703)-308-0956.



David S. Blum

May 29, 2002